SOLAR OBSERVATIONS.

SOLAR AND SKY RADIATION MEASUREMENTS DURING JULY, 1921.

By HERBERT H. KIMBALL, Meteorologist.

[Dated: Solar Radiation Investigations Section, August 31, 1921.]

For a description of instruments and exposures, and an account of the method of obtaining and reducing the measurements, the reader is referred to this REVIEW for April, 1920, 48: 225.

The monthly means and departures from normal of Table 1 indicate that solar radiation intensities were close to normal intensities for July at Lincoln, Nebr., and Santa Fe, N. Mex., above normal at Madison, Wis., and decidedly below normal at Washington, D. C. The hazy condition at Washington, mentioned in connection with the June radiation measurements, continued into July, being particularly marked with the cloudless skies of the 5th and the 8th. It was an upper haze, as on the 8th mountains 30 miles distant were distinctly visible.

Table 2 shows that the total radiation received from the sun and sky was close to normal at both Washington and Madison, except at Washington during the week beginning July 9, which was unusually cloudy. A feature of the Callendar pyrheliometer record for this week at Washington was a trace showing zero radiation between 3 p. m. and 4 p. m., July 15, during a heavy thunderstorm. At this time it was so dark that work indoors was impossible after the electric lighting plant ceased to function. The daylight appeared to be less intense than at the end of civil twilight with a clear sky.[1]

Skylight polarization measurements made at Madison on seven days give a mean of 65 per cent with a maximum of 70 per cent on the 21st. These are close to average July values for Madison. At Washington, measurements obtained on four days give a mean of 38 per cent, with a maximum of 51 per cent on the 28th and a minimum of 7 on the 8th. All these values are below the July averages for Washington.

TABLE 1.—*Solar radiation intensities during July, 1921.*

[Gram-calories per minute per square centimeter of normal surface.]

Washington, D. C.

Date.	Sun's zenith distance. 8 a.m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon.
	75th meridian time.	Air mass. A. M.					P. M.				Local mean solar time.
	e.	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e.
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
July 5	19.23					0.63					21.23
8	20.57				0.21	0.60					19.23
18	16.20			0.57	0.79	1.09	0.84	0.66			14.10
21	12.24		0.69								11.81
25	18.59				0.85						14.60
26	16.79		0.50	0.60	0.79	0.97					14.10
27	17.96	0.50	0.60	0.75	0.98	1.29					19.23
28	18.59				0.98						19.23
Means		(0.50)	0.60	0.64	0.77	0.92	(0.84)	(0.66)			
Departures		−0.09	−0.10	−0.18	−0.14	−0.28	−0.13	−0.10			

[1] Kimball, Herbert H.: The duration and intensity of twilight. MO. WEATHER REV., November, 1916, vol. 44, diagram, p. 619.

*Extrapolated.

TABLE 1.—*Solar radiation intensities during July, 1921*—Continued.

Madison, Wis.

Date.	Sun's zenith distance. 8 a.m.	78.7°	75.7°	70.7°	60.0°	0.0°	60.0°	70.7°	75.7°	78.7°	Noon.
	75th meridian time.	Air mass. A. M.					P. M.				Local mean solar time.
	e.	5.0	4.0	3.0	2.0	*1.0	2.0	3.0	4.0	5.0	e.
	mm.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*mm.*
July 1	16.20				0.97						15.6
7	19.89					1.13					17.9[illegible]
9	15.11			0.97							14.60
10	15.11		0.84	0.99	1.10	1.23					10.50
11	15.11			0.90	1.08	*1.29					13.13
12	17.37	0.56	0.65	0.80		1.22					16.20
15	14.60					1.21					12.24
16	14.60		0.74	0.85		1.28					11.81
19	13.13				1.16						12.24
20	11.81		0.78	0.94	1.14	1.38	1.16				8.18
21	11.38		0.91	1.02	1.15	1.27	1.05	0.89			9.47
27	18.59					1.25					18.59
28	14.10					1.37					15.11
30	15.11				1.02	1.34					15.11
Means		(0.56)	0.78	0.92	1.09	1.27	(1.10)	(0.89)			
Departures		−0.07	+0.02	+0.04	+0.07	+0.02	+0.11	−0.01			

Lincoln, Nebr.

July 7	16.20					1.32	1.16	1.02	0.88		22.00
8	10.97							0.99	0.86		13.61
9	15.11			0.98	1.14						13.13
11	16.79			0.92	1.06	1.23					13.61
15	16.79			0.93	1.07	1.22					15.65
16	11.60				1.17		1.08	0.80	0.77		14.60
19	15.65			0.97	1.15	1.36		0.93	0.77		15.65
20	15.11		0.76	0.95	1.13	1.28					13.61
21	14.60						0.96	0.69			13.61
25	14.10				0.85						16.79
27	17.37			0.96			1.06				17.37
29	16.20				1.03	1.26					20.57
Means		(0.76)	0.95	1.08	1.28	1.06	0.89	0.82			
Departures		−0.04	+0.05	±0.00	−0.06	−0.01	±0.00	−0.07			

Sante Fe, N. Mex.

July 9	7.57		0.99	1.13							7.29
12	8.48				1.20						9.14
13	8.48		0.92	1.07	1.24	1.44					9.83
14	9.83		0.83	1.08	1.24						10.97
16	9.83		0.94	1.12	1.29						10.59
29	8.81		0.93	1.12	1.22						9.83
Means			0.93	1.10	1.24	(1.44)					
Departures			−0.01	+0.02	+0.02	+0.02					

*Extrapolated.

TABLE 2.—*Solar and sky radiation received on a horizontal surface.*

Week beginning—	Average daily radiation. Washington.	Madison.	Lincoln.	Average daily departure for the week. Washington.	Madison.	Lincoln.	Excess or deficiency since first of year. Washington.	Madison.	Lincoln.
	cal.	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*	*cal.*
July 2	535	545	.....	+ 22	+ 5	.....	+417	−4,596	.....
9	373	606	.....	−129	+71	.....	−483	−4,098	.....
16	583	536	.....	+ 92	+17	.....	+164	−3,980	.....
23	535	460	.....	+ 55	−36	.....	+548	−4,232	.....

MEASUREMENT OF THE SOLAR CONSTANT OF RADIATION AT CALAMA, CHILE, JUNE, 1921.

NOTE.—The above report, having been delayed in transmission from Chile, will appear in the next issue of the REVIEW.—EDITOR.